

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An external pressure type hollow fiber membrane module of an external pressure type having a membrane occupying rate set to between 0.3 to 0.6, comprising:

a hollow fiber membrane bundle formed of a plurality of hollow fiber membranes,

a cylindrical housing, and

a nozzle for allowing a fluid to enter into and exit therefrom,

wherein the hollow fiber membranes are adhesively-fixedly adhered to each other and to the inner wall of the housing at ends of the hollow fiber membrane bundle and form a membrane chargeable region in the inner side of the adhesively-fixed ends;

wherein a hollow part is opened in one side or both sides of the adhesively-fixed ends; and wherein the nozzle for allowing the fluid to enter and exit therefrom is installed on a side face of the housing of at least one adhesively-fixed end at which the hollow part is opened;

wherein a membrane-occupying rate in the housing is set at 0.3 to 0.6, [[and]]

wherein a ratio PB/PA of membrane-occupying rates is 0.50 or more but 0.95 or less when each of PA and PB is defined as the membrane-occupying rate in a neighboring region (A) of the nozzle and a non-neighboring region (B) of the nozzle which includes all regions other than neighboring region (A) in the membrane chargeable region in the inner side of an adhesively-fixed end of the opened hollow part,

wherein a partial portion of a circumference of the hollow fiber membrane bundle is within the neighboring region (A), and the rest of the circumference of the hollow fiber membrane bundle is within the non-neighboring region (B), the membrane-occupying rate at the partial portion of the circumference of the hollow fiber membrane bundle is higher than the membrane-occupying rate at the rest of the circumference of the hollow fiber membrane bundle,

and the membrane-occupying rate at the rest of the circumference of the hollow fiber membrane bundle is not higher than the membrane-occupying rate at the center of the hollow fiber membrane bundle.

2. (Currently Amended) An external pressure type hollow fiber membrane module of an external pressure type having a membrane occupying rate set to between 0.3 to 0.6, comprising: a hollow fiber cartridge having a hollow fiber membrane bundle formed of a plurality of hollow fiber membranes, of which both end parts are adhesively-fixed and hollow parts in at least one end of adhesively-fixed ends are opened and form a membrane chargeable region in the inner side of the adhesively-fixed ends; and

a cylindrical housing accommodating the cartridge and having a nozzle for allowing a fluid to enter and exit therefrom installed on at least one side face, in which the nozzle installed is fixed so as to be placed in the vicinity of the inner surface of an adhesively-fixed part in the opened hollow parts side in the hollow fiber membrane cartridge;

wherein a membrane-occupying rate in the housing is set at 0.3 to 0.6, [[and]]

wherein a ratio PB/PA of membrane-occupying rates is 0.50 or more but 0.95 or less when each of PA and PB is defined as the membrane-occupying rate in a neighboring region (A) of the nozzle and a non-neighboring region (B) of the nozzle which includes all regions other than the neighboring region (A) in the membrane chargeable region in the inner side of an adhesively-fixed end of the opened hollow part, and

wherein a partial portion of a circumference of the hollow fiber membrane bundle is within the neighboring region (A), and the rest of the circumference of the hollow fiber membrane bundle is within the non-neighboring region (B), the membrane-occupying rate at the

partial portion of the circumference of the hollow fiber membrane bundle is higher than the membrane-occupying rate at the rest of the circumference of the hollow fiber membrane bundle, and the membrane-occupying rate at the rest of the circumference of the hollow fiber membrane bundle is not higher than the membrane-occupying rate at the center of the hollow fiber membrane bundle.

3. (Previously Presented) The external pressure type hollow fiber membrane module according to claim 1 or 2, wherein in the neighboring region (A) of the nozzle, among a membrane chargeable region in the inner side of an adhesively-fixed part, membrane occupying-rate PC is 0.5 times or more but 2.0 times or less with reference to membrane-occupying rate PA in the neighboring region (A), in every unit region (C) constituting the neighboring region (A).

4. (Previously Presented) The external pressure type hollow fiber membrane module according to claim 1 or 2, wherein PB includes region PB1 and PB2, and wherein PA, PB1 and PB2 of the membrane-occupying rates have the relation of $PA \geq PB1 \geq PB2$ and further PA is 0.40 or more but 0.60 or less and PB2 is 0.20 or more but less than 0.40 when each of PB1 and PB2 is defined as a membrane-occupying rate in a first non-neighboring region (B1) and a second non-neighboring region (B2) in the non-neighboring region (B) of the nozzle among the membrane chargeable region in the inner side of an adhesively-fixed part and

wherein the non-neighboring region (B1) is located in a side close to the nozzle and wherein the non-neighboring region (B2) is located in a side distant from the nozzle.

5. (Previously Presented) The external pressure type hollow fiber membrane module according to claim 1, wherein the non-neighboring region (B) of the nozzle among the membrane chargeable region in the inner side of an adhesively-fixed part includes at least one unit region in which membrane-occupying rate PC in unit region (C) constituting the non-neighboring region (B) is less than 0.5 times with reference to the membrane-occupying rate PB in the non-neighboring region (B).

6. (Original) The external pressure type hollow fiber membrane module according to claim 1 or 2, wherein a current plate is arranged in the vicinity of the nozzle of outer circumference parts of the hollow fiber membrane bundle.

7. (Original) The external pressure type hollow fiber membrane module according to claim 6, wherein the current plate is cylindrical, accommodates the hollow fiber membrane bundle inside of it, has a plurality of through-holes in a wall surface except the vicinity of the nozzle, and has no through-hole in the vicinity of the nozzle.

8. (Previously Presented) The external pressure type hollow fiber membrane module according to claim 1 or 2, wherein an adhesive bond part constituting the adhesively-fixed part is made of a single layer of a high polymer material, and has the hardness of 50A to 70D in a range of operating temperatures.

9. (Withdrawn) A method for manufacturing the external pressure type hollow fiber membrane module according to claim 1 or 2 including: previously inserting a plurality of columnar materials into an end of a hollow fiber membrane bundle at least in a side of making a hollow part opened; accommodating the hollow fiber membrane bundle which keeps the state of the insertion in a vessel for forming an adhesively-fixed part; injecting an adhesive bond into the vessel and curing it; then cutting an end face of the hollow fiber membrane bundle to form the adhesively-fixed part; and consequently making the columnar materials having a length of 0.3 to 0.9 times with reference to a thickness of the adhesively-fixed part exist at least in the adhesively-fixed part of a neighboring region (A).

10. (Withdrawn) A method for manufacturing the external pressure type hollow fiber membrane module according to claim 1 including: accommodating a hollow fiber membrane bundle in a housing case having a nozzle for allowing a fluid to enter and exit therefrom at least on one side face; horizontally rotating the housing case in a state of keeping the nozzle directing toward a lower direction than a horizontal direction; injecting an adhesive bond into the housing case under the centrifugal force; and curing it to form an adhesively-fixed part.

11. (Currently Amended) An external pressure type hollow fiber membrane module of an external pressure type having a membrane occupying rate ~~normally~~-set to between 0.3 to 0.6, comprising:

a cylindrical housing;

a hollow fiber membrane bundle formed of a plurality of hollow fiber membranes located inside of the cylindrical housing;

a nozzle for allowing a fluid to enter into and exit from the housing, located on a side wall of the cylindrical housing

wherein the membrane bundle extends across the cylindrical housing and is separated in cross-section into two regions, a first region taking up at least one fourth of a cross-sectional area of the membrane bundle located between a portion of the wall of the cylinder that extends about the nozzle to approximately the center of the cylinder, and a second region that extends from the first region to the side of the wall of the cylinder that is opposite to the side of the wall in which the nozzle is located, [[and]]

wherein a ratio PB/PA of membrane-occupying rates is 0.50 or more but 0.95 or less when PA is defined as the membrane-occupying rate in the first region, and PB is defined as the membrane-occupying rate in the second region, [[and]]

wherein the membrane occupying rate in the housing is between 0.3 to 0.6; and

wherein a partial portion of a circumference of the hollow fiber membrane bundle is within the first region, and the rest of the circumference of the hollow fiber membrane bundle is within the second region, the membrane-occupying rate at the partial portion of the circumference of the hollow fiber membrane bundle is higher than the membrane-occupying rate at the rest of the circumference of the hollow fiber membrane bundle, and the membrane-occupying rate at the rest of the circumference of the hollow fiber membrane bundle is not higher than the membrane-occupying rate at the center of the hollow fiber membrane bundle.

12. (Currently Amended) An external pressure type hollow fiber membrane module of an external pressure type having a membrane occupying rate ~~normally~~ set to between 0.3 to 0.6, comprising:

a rod-shaped bundle of hollow fiber membranes formed of a plurality of hollow fiber membranes,

a cylindrical housing, and

a nozzle for allowing a fluid to enter into and exit from the housing,

the hollow fiber membranes being fixedly adhered to each other and to the inner wall of the housing at ends of the hollow fiber membrane bundle;

a hollow part opened in one side or both sides of adhesively-fixed ends of the hollow fiber membrane; and

wherein the nozzle for allowing the fluid to enter and exit therefrom is installed on a side face of the housing of at least one adhesively-fixed end at which the hollow part is opened;

wherein the rod-shaped bundle of hollow fiber membranes extends across the cylindrical housing and has a neighboring region (A) having a cross-sectional area that surrounds the nozzle and extends from the nozzle approximately half way to a side of the cylindrical housing opposite to the nozzle, and a non-neighboring region (B) of the nozzle which has a cross-sectional area that encompasses a cross-sectional area of the cylindrical housing other than that cross-sectional area encompassed by neighboring region (A), [[and]]

wherein the membrane occupying rate in the housing is between 0.3 and 0.6, and

wherein a partial portion of a circumference of the rod-shaped bundle of hollow fiber membranes is within the neighboring region (A), and the rest of the circumference of the rod-shaped bundle of hollow fiber membranes is within the non-neighboring region (B), the

membrane-occupying rate at the partial portion of the circumference of the rod-shaped bundle of hollow fiber membranes is higher than the membrane-occupying rate at the rest of the circumference of the rod-shaped bundle of hollow fiber membranes, and the membrane-occupying rate at the rest of the circumference of the rod-shaped bundle of hollow fiber membranes is not higher than the membrane-occupying rate at the center of the rod-shaped bundle of hollow fiber membranes.